

SMU 56/57 Demonstration Project Air Monitoring Project Overview

Design Considerations

The dredging and disposal of PCB containing sediments from the Fox River were anticipated to have impacts in two major areas, those being around the dredging and processing area, and near the disposal site. As the project progressed, more distant monitoring sites were established to determine background concentrations in an effort to further characterize potential contributions from the river itself.

The general design of the main portion of the project involved deploying samplers along a grid surrounding the project site and work area to collect samples for spatial analysis. The grid was intended to provide upwind and downwind locations for each sampling event. Monitoring was conducted throughout the duration of the demonstration, with some pre-dredging samples collected for estimating background concentrations.

An outer ring of samplers was established at approximately 2 kilometers from SMU 56/57. A second ring of samplers was located approximately 1 kilometer away, with the remaining samplers deployed at 250 and 500 meters from the center of the remediation property. The closest sampling platforms were on site, among the sediment processing equipment.

Landfill oriented sites were established on private property to both the north and south sides. These samplers ranged from 650 to 1,250 meters from the active cell. No samplers were placed on the landfill property itself.

The intended frequency of sampling was sufficient to generate at least 12 sets of samples (approximately one sample set per week per sample location). This level of effort was intended to ensure high confidence that air impacts, if any, should be distinguishable from general background and provide a data set from which the objectives can be evaluated.

Establishment of an ambient level of concern was based on a standard reference unit risk value established by the EPA at 1.1×10^{-4} . This means that if someone was exposed to a concentration of 1.0 ug/m^3 PCB in air for 70 years, they would have a roughly one in 10,000 risk of developing cancer that could be attributed to this exposure. The level of concern was set at 0.1 ug/m^3 (100 ng/m^3), or a one in 100,000 risk of cancer over 70 years exposure.

There is no established quantitative relationship between risk and exposure time. The actual risk that can be associated with a short term project is probably much less, perhaps less than 1%, than long term exposures typically evaluated using risk based analysis of cancer potential. Therefore, the level of concern can be seen as conservative, given the available data.

Air quality analysis performed using the Industrial Source Complex Short-Term Model version 3 (ISCST3) provided an estimate of the extent and magnitude of PCB dispersion

SMU 56/57 Demonstration Project Air Monitoring Project Overview

surrounding the work area. The entire project area was treated as a single source about 30 feet square for simplicity.

The potential magnitude of PCB loss to the atmosphere was unknown. Hypothetical contour plots of the anticipated concentrations around the site were prepared for 2 emission rates prior to the project: 1 lb/hour, and 1 lb/day. Assuming 4500 – 6000 lbs of PCB to be removed, over the course of 90 days, the rate of 1 lb/hour is equivalent to a 35 – 50% loss of PCB to the atmosphere, while 1 lb/day is about 1 – 3%. These levels were chosen on the basis of assuming that this mechanism of PCB loss would lead to a situation of concern, either through health effects, or through loss of an appreciable quantity of PCB.

The higher emission rate estimate leads to modeled concentrations of 0.1 ug/m^3 up to 2 kilometers away, with concentrations greater than 1.0 ug/m^3 as far as 500 meters from the source. The lower emission rate yields concentrations of 0.01 ug/m^3 up to a kilometer distant, and concentrations of 0.1 ug/m^3 up to 250 meters from the theoretical single source.

Previous air sampling conducted by the DNR in the area yielded ambient concentrations ranging from $<0.1 - 2.1 \text{ ng/m}^3$. Differentiation between the PCBs already present in the atmosphere and those associated with remediation requires concurrent background sampling. Loss of a pound of PCB per hour was regarded as highly unlikely, while the lower rate modeled appeared more plausible.

Sampling and Analytical Protocols

Samples were collected by DNR personnel following EPA Method TO-4, Determination of Pesticides and Polychlorinated Biphenyls in Ambient Air Using High Volume Polyurethane Foam (PUF) Sampling Followed by Gas Chromatographic/Multi-Detector Detection (GC/MD), as outlined in the DNR Air Monitoring Handbook, Method OP 8.5, Sampling Semi-Volatile Organic Compounds Using a PS-1 Sampler.

Analysis was performed by the State Laboratory of Hygiene (SLOH), Air Chemistry Section, following the protocols in their internal Standard Operating Procedure (SOP) titled “Ambient Air for Pesticide and PCB Residues – Modified EPA Method”, SOP# 1920, revision 2.1, dated September 1, 1999.

Experience in monitoring air has shown wide seasonal variability in ambient PCB concentration. The Wisconsin Urban Air Toxics monitoring program’s PCB sampling protocol calls for a 72 hour sample period between April and November, and a 144 hour composite of 2 sample periods for the remainder of the year. Current method detection limits theoretically allow the collection of detectable quantities within a 24 hour period during the summer and early autumn.

SMU 56/57 Demonstration Project Air Monitoring Project Overview

Monitoring around the remediation site started on a 24 hour basis, to provide maximum comparability with daily mass balance information, reduce the effect of changing winds on the dispersion pattern, and reduce the chance of sample breakthrough in the on-site samplers. Sample time increased to 72 hours at the end of October, to enable continued detection of PCBs at the maximum number of locations.

Back-up sampling plugs were incorporated with the 72 hour sampling protocol to evaluate potential sample loss related to the increased sample time and volume. Sampling rate at the most contaminated sites was decreased at this time as well. Approximately 10% of the back-up samples were submitted for analysis, with the remainder stored in a freezer for potential future analysis should any question arise relating to sample loss.

Based on a 300 – 400 m³ sample, and a 0.1 ug total PCB as Aroclor laboratory limit of detection (LOD), method detection limits are estimated to be about 0.3 ng/m³ during the 24 hour sampling portion of the project. Detection limits during the 72 hour portion of the test are on the order of 0.1 ng/m³.

Sample Handling

Each sample was accompanied by a corresponding field sheet including the following information: unique field number, identification of site by name and site number, unique sample head and sampler identifiers, sampler calibration code, pre- and post- sample flow and elapsed timer readings, and complete chain of custody information. A comments section included space for observations, including reasons for void samples.

All samples were collected using standard Anderson or General Metals Works PUF sampling heads. Each head was uniquely identified for sample tracking. Preparation for sampling occurred in Madison, with chain of custody records maintained to document all phases of sample handling (preparation, shipping, setup, collection, shipping, packaging and delivery to lab).

Each sample head was stored in separate zip lock plastic bags associated with specific sample heads. Bags were periodically replaced. Sample heads were stored and transported in uniquely identified air tight 110 quart coolers, documented on the chain of custody records. Samples were transported en masse by the network coordinator.

Spiked samples were prepared using reagents at SLOH by the network coordinator. These samples were stored separately from the regular samples in all phases of sample collection. Spiked samples were submitted to the lab as blind field spikes, with the quantity of Aroclor added not revealed to the analyst.

All field data and chain of custody records are maintained both as hard copy and within an Access database used to generate the Sample Collection Log included as Appendix A.

SMU 56/57 Demonstration Project Air Monitoring Project Overview

Data Quality Objectives

Validity of data is determined by evaluating certain parameters associated with the sampling and analysis process against defined limits of error. Laboratory related data quality parameters include sample holding time, data completeness, stability of instrument calibration, sample extraction efficiencies and background contamination. This data was evaluated by an independent third party and is discussed in the Data Quality Review.

Sampling related data quality objectives incorporated into this report include project completeness, duplicate precision, spike recovery accuracy, and blank sample material background levels. The completeness criteria is evaluated at several levels: overall (all samples, all sites), per site, per sample event, and quality control samples. Analytical completeness is considered as well. The minimum goal is 75% of attempted samples. All categories which fail to meet this goal are clearly identified, and the data therein subject to qualifiers.

One duplicate sampler was deployed throughout the sampling program, with a second added at the commencement of 72 hour sampling. The quality objective for duplicate samples according to EPA Method TO-4 is $\pm 25\%$ relative percent difference. Most DNR collected duplicates have historically been within $\pm 15\%$ relative percent difference.

Accuracy in sampling and analysis is evaluated using spiked duplicate and spiked blank samples. Two sets of spiked duplicates and blanks were submitted for analysis. Evaluation of analytical recovery is based on the spiked blank, while collection efficiency is evaluated by comparing the spiked duplicate with the associated ambient sample. Recovery and collection efficiencies of $100 \pm 25\%$ are considered acceptable performance.

The data quality objective for blank samples is an undetectable quantity. A variety of different types of blanks was prepared in an effort to verify cleanliness at all stages of the entire sampling process, including raw materials, sample preparation, transportation and setup. Sampler failures provide blanks measuring potential contamination associated with passive ambient exposure. Types of blank samples are clearly identified in the Sample Collection Log.

A potential problem associated sampling semi-volatile organic compounds in air is loss of material from the adsorbent. The general success of 24 hour sampling was documented with the development of Method TO-4 by the EPA. However, the 72 hour protocol used is a deviation from the established method, and evaluation of sample loss during the extended sampling period was incorporated as a part of this study. Sample loss is evaluated by determining the percentage of total material collected on secondary, back up sampling materials. Any back half sample containing greater than 10% of total Aroclor is considered suspect, and may represent a sample loss situation.

SMU 56/57 Demonstration Project Air Monitoring Project Overview

Sampling Locations

A total of 25 sampling sites were established for this test. Locations were chosen on the basis of approximate distance from and orientation to the central site (FR01). The short notice provided for preparing this project led to a number of difficulties in meeting the project design parameters. Several of the sites did not meet EPA siting criteria in all ways, while others had problems related to sufficient power to operate the samplers consistently. In addition, the design parameters were not entirely met, in that the concentric rings were not filled in all cases. In part this was because of a lack of sufficient equipment to operate as many sites as the design called for. Site specific shortcomings are detailed in the Site Descriptions section following.

Locations were precisely determined using a hand-held GPS unit to prepare an accurate map for receptor modeling. Location parameters include longitude, latitude, distances from the central site and SMU 56/57, and, in the case of the landfill samples, distance from the disposal site. Samplers were deployed on platforms approximately one meter off the ground, or on rooftops. In addition, current and historic results from pre-existing PCB monitoring sites are included.

Project specific sample sites were uniquely designated with an “FR##” code for the main portion of the project, where the numerical portion of the code ranged from “01” for the central site, to “23” for the final background site. Landfill oriented sites were designated with an “LF0#” code. Other monitoring information incorporated from previously existing sites uses strictly alphabetic identifying codes.

A list of all site designations and location names included in this study is presented in Table O-1 at the end of this section, along with which portion of the study the samplers are associated with, and distances from the site to the main sites located on the remediation project property. Figures 1 and 2 present maps showing site locations. All main study locations are shown in Figure 1, while Figure 2 shows all of the sites associated with this effort.

A meteorological station for the collection of wind speed, wind direction and ambient temperature on a continuous basis was established by the primary project contractor, Montgomery Watson. No attempt was made to ensure that this site met EPA siting criteria for met sites. Wind speed and direction are vector mean averaged to the nearest 0.1 mph and 10° over the sampling period for gross determination of trajectory analysis. Meteorological data from the National Weather Service station at Austin Straubel airport is used primarily, for reasons discussed in the Data Quality Review.

Site Descriptions

The standard PCB monitoring site includes a high volume sampler mounted either on a 4’X4’ platform 4’ high, or directly on a rooftop. Whether the site is located on a roof top

SMU 56/57 Demonstration Project Air Monitoring

Project Overview

or on a platform is documented in the site list. Duplicate stations at FR01 and FR03 consisted of two such platforms side by side.

Samplers located on the remediation site include those at the Settling Basin (FR01), the Filter Press (FR02), and Southeast Remediation (FR04). All of these samplers were based on platforms. Technically all of these sites violated EPA siting criteria for general air monitoring, in that they were too close to potential sources of PCBs, and therefore can not provide generally representative ambient concentrations. However, considering that the purpose of this project was to determine losses from these sources, the proximity of the samplers makes sense. The remaining samplers of the main study (FR03, FR05 – FR21) are collectively grouped as “non-remediation” sites.

The Settling Basin site (FR01) was established on the north side of the basins, just outside of the exclusion zone surrounding the water processing equipment. This was considered the central site for design considerations, as it was located in about the middle of the remediation work area, and was anticipated to have the greatest impact on PCB volatilization, on the basis of the high surface area of the settling basins. This site incorporated a duplicate sampler throughout the project. Numerous samples were lost from this location because of power problems, most frequently related to remediation personnel unplugging the samplers when they needed power for other equipment.

The Filter Press sampler (FR02) was located just outside of the dried sediment handling area, where loading of the material onto trucks occurred. Although on the remediation property, this site was part of the 250 meter ring. During the first portion of sampling, this location returned the highest ambient PCB concentrations, most likely related to suspended particulate matter from the processed sediment.

The Southeast Remediation location (FR04) was intended to be between the settling basins and the Fox River as part of the 250 meter ring. There was insufficient power present in this area, so the sampler was eventually re-located to the southeast corner of the settling basins. Several samples were lost from this site because of power related problems, both before and after the move.

The Leicht Waterfront location (FR03) was part of the 250 meter ring. This was a platform mounted sampler located directly on the Fox River waterfront, just off the remediation property. A second platform and sampler were added when more equipment became available during the 72 hour portion of the project. This site is one of three that can be considered waterfront locations, intended to provide evidence for the ambient contribution of PCBs from the river itself. The final sampler of the 250 meter ring was located on top of Building 78 on the Fort James mill property adjacent to the remediation property (FR05).

Samplers in the nominally 500 meter ring throughout the project include Green Bay Drop Forge (FR06), the USGS Trailer (FR07) and the Ft. James Water Intake (FR08). The sampler at FR06 was located on a platform, while the other two were roof top samplers. The USGS Trailer was located across the river from the Leicht Waterfront site, about 50

SMU 56/57 Demonstration Project Air Monitoring

Project Overview

meters from the river. The Ft. James Water Intake site was located on top of a small utility building about 20 meters from the river. This sampler was the closest one to the actual dredging area. Both FR07 and FR08 are considered river oriented sites along with FR03.

Sampler FR09, located on top of the Halron Oil building across the street from the remediation property, was intended to be part of the 500 meter ring. It was, however, far closer to the remediation zone than intended, so it formed, in essence, an additional 250 meter ring sampler. When a hole in the 1 kilometer ring was found, this sampler was moved to an alternate location (FR14), and the site closed for the remainder of the project. A total of three samples were obtained from this site.

The one kilometer ring of samplers included sites FR10 through FR17. It should be noted that the project began with only 6 of the eight anticipated samplers in this ring. A seventh (FR14) was added after the third sample period to fill a gap in coverage which became apparent when the site locations were mapped. No site was assigned the FR15 designation.

Rooftop samplers in the one kilometer ring were located at the Green Bay Fire Station #4 (FR10), Leopold School (FR11), the St. Vincent Dialysis Center (FR12), Brennan Buick (FR13) and American Auto (FR17). The samplers at the Zollar Residence (FR16) and the Catholic Diocese (FR14) were mounted on platforms at ground level. FR14 was established after the third sampling period to fill a gap in site orientation discovered upon mapping the sites. The samplers at FR11 and FR16 were relocated slightly (<50 meters) after several sample runs to move them out of potential wind shadows and to conform to EPA siting criteria.

The 2 kilometer ring of samplers was intended to provide probable local background data during the project, as well as providing information about maximum zone of impact in case either emissions exceeded expectations or modeling assumptions proved incorrect. Samplers at WLUK-TV (FR18) and the Davis Garage (FR19) were located on rooftops. The latter location, on top of a garage along an alleyway in a residential area north of the remediation property, was marginally acceptable in terms of EPA siting criteria.

Both of the final two samplers in the outermost ring of the main study were mounted on platforms and had siting criteria related problems. The former of these, FR20, was located in a residential backyard with significant potential wind shadowing effects from surrounding houses and trees. Attempts to relocate the sampler to a more appropriate location in this area were not successful. The final 2 kilometer site, FR21, was also a residential backyard site with potential wind shadowing. This site was moved less than 50 meters to a more open adjacent backyard part way through the sampling. It has been observed within the context of the Wisconsin Urban Air Monitoring program that concentrations in Wisconsin Rapids are significantly lower than those found in Green Bay. Additional background sampling was found desirable to determine whether samples collected from more distant sites would yield results lower than those found within the

SMU 56/57 Demonstration Project Air Monitoring Project Overview

urban area. In essence then, these more distant samplers were an effort to determine the extent of air impacts associated with the urban area.

Two distant sites were established to provide this information (FR22 and FR23). Both incorporated samplers mounted on platforms well away from the Fox River and the central urban area. Both locations conformed to EPA siting criteria for background sites.

The final sites established for the purposes of the current study were associated with the Ft. James Landfill, which was chosen for disposal of the PCB containing sediments. A total of three sites were established around this area, one on the north side (LF03) and two on the Oneida Bingo and Casino property on the south side (LF01 & LF02). The sampler at LF03 was mounted on a platform, and required slight adjustment to conform entirely with EPA siting criteria.

The samplers located on Oneida property were both roof mounted. The Oneida Nation requested that EPA personnel audit these samplers to ensure that they were properly sited and operated. The audit procedures were then expanded to the remainder of the project. The majority of the sites were at least observed with respect to siting criteria. Observations relative to siting criteria made above result from these visits. The actual audit results are discussed in the Data Quality Review following.

While the preceding samplers represent all of the sites established for the purposes of this study, additional applicable data is available through the Wisconsin Urban Air Toxics program. Ambient monitoring for PCBs has been a part of this effort since its inception in 1991. Sampling in Green Bay has taken place at three different locations during this time. Both current and historic results are incorporated into this report for comparison purposes.

Samples from the current monitoring site (GBUATM) were collected at twice the usual rate employed by the Urban Air Toxics Monitoring program beginning in August, and continuing through December 1999. This increase in sampling was intended to provide additional information for the remediation project study. The current site has been in existence since May, 1997.

Former sites include the Fox River HAP station located on Washington Street directly adjacent to the Fox River, which was operational between April 1993 and June 1997, and the Bay Beach HAP station located on the shore of Green Bay between July 1991 and April 1993. While there were no detects at the Bay Beach site, improvements in analytical and sampling methods have yielded nearly 100% detects since May 1995.

Results obtained from the Urban Air Toxics Monitoring station at Witter Field in Wisconsin Rapids are included as well. There are no known significant local areas of contamination in the Wisconsin Rapids area, so that results obtained there represent concentrations associated with a relatively clean urban area.

***SMU 56/57 Demonstration Project Air Monitoring
Project Overview***

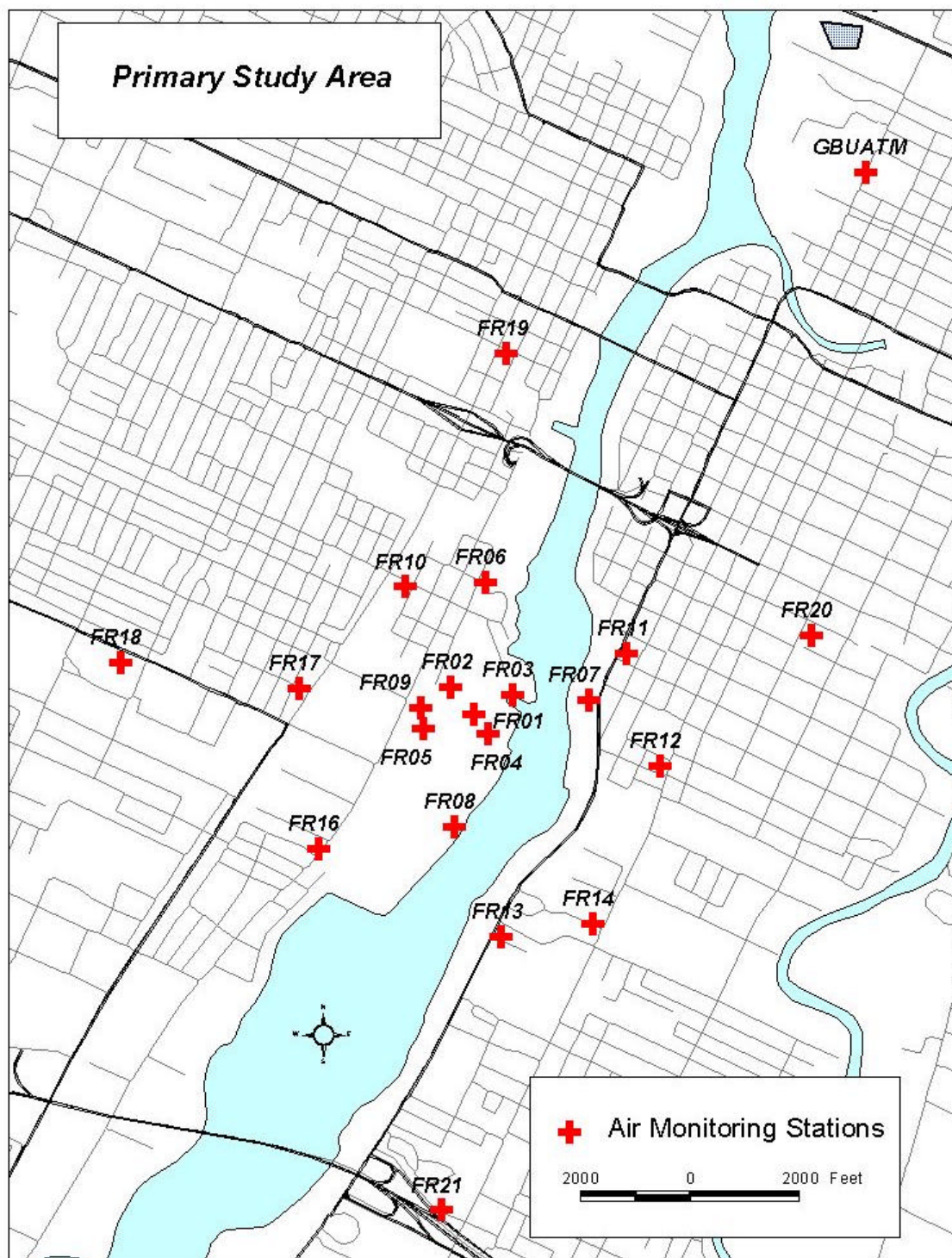
Table O-1: Sampler Locations

Site Designation				Distances to		
	Location Name	Study	Type	FR01	FR02	Landfill
FR01	Settling Basin	Main	Platform	0	200	
FR02	Filter Press	Main	Platform	200	0	
FR03	Leicht Waterfront	Main	Platform	290	360	
FR04	East Remediation	Main	Platform	140	330	
FR05	Ft. James Bldg 78	Main	Rooftop	290	280	
FR06	Green Bay Drop Forge	Main	Platform	740	610	
FR07	USGS Trailer	Main	Rooftop	650	770	
FR08	Ft. James Water Intake	Main	Rooftop	630	780	
FR09	Halron Oil	Main	Rooftop	300	210	
FR10	Fire Station #4	Main	Rooftop	800	610	
FR11	Leopold School	Main	Rooftop	910	990	
FR12	St. Vincent Dialysis Center	Main	Rooftop	1070	1240	
FR13	Brennan Buick	Main	Rooftop	1240	1410	
FR14	Catholic Diocese	Main	Platform	1340	1530	
FR16	Zollar Residence	Main	Platform	1140	1160	
FR17	American Auto	Main	Rooftop	980	850	
FR18	WLUK-TV	Main	Rooftop	1980	1840	
FR19	Engle's Garage *	Main	Rooftop	2010	1880	
FR20	Wulk Residence	Main	Platform	1920	2020	
FR21	Verhagen Residence	Main	Platform	2750	2900	
FR22	Fire Station #7	Distant	Platform	9860	9950	
FR23	Rick Wulk Residence	Distant	Platform	19130	18940	
LF01	Oneida Bingo	Landfill	Rooftop	7680	7560	840
LF02	Oneida Ramp	Landfill	Rooftop	7330	7210	650
LF03	Sorensen Residence	Landfill	Platform	8260	8110	1240
GBUATM	Younkers Air Monitoring Site	WUATM	Rooftop	3720	3670	
GBFox	Former Fox River HAP Station	WUATM	Rooftop	1990	1920	
GBBay	Former Bay Beach Station	WUATM	Rooftop	5170	5120	
WRUATM	Witter Field HAP Station	WUATM	Rooftop	143040	142930	

* Site FR19, Engle's Garage, was incorrectly labeled Davis Garage on all field sheets.

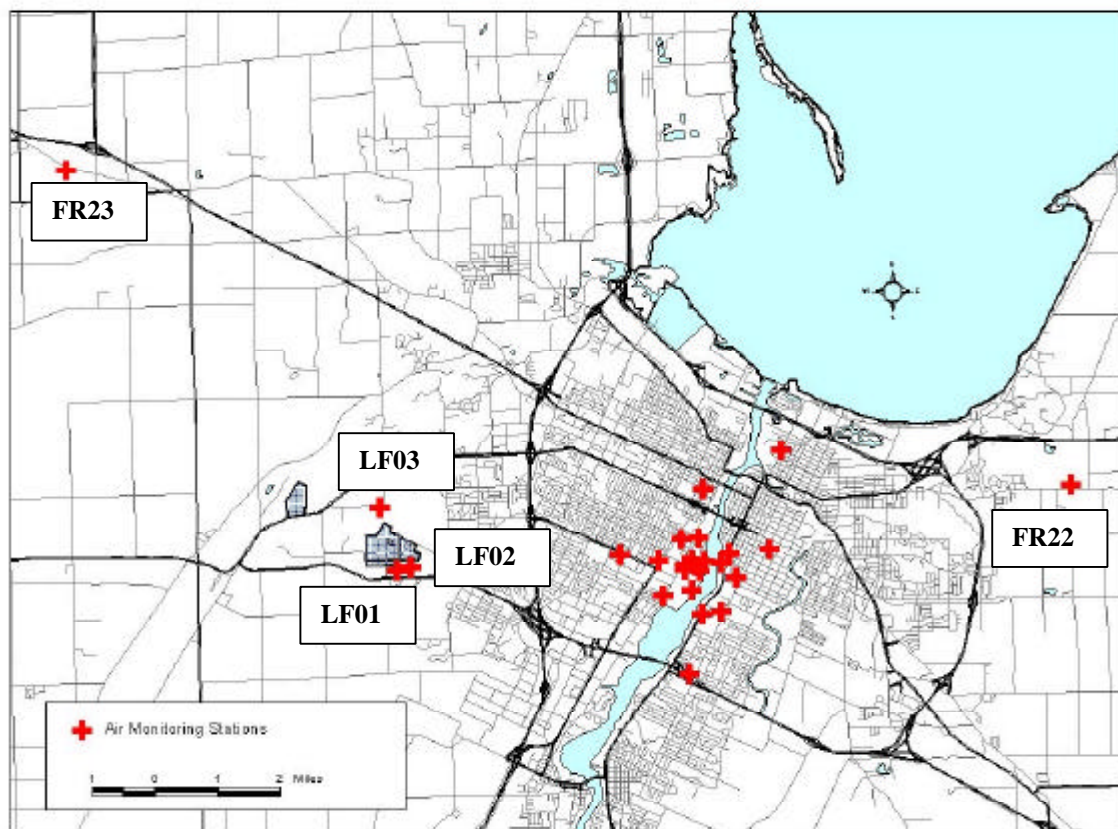
*SMU 56/57 Demonstration Project Air Monitoring
Project Overview*

Figure 1: Main Study Site Locations



SMU 56/57 Demonstration Project Air Monitoring Project Overview

Figure 2: Distant and Landfill Sites



***SMU 56/57 Demonstration Project Air Monitoring
Project Overview***